Kingston's Server Memory Dynamic Burn-In Testing: Setting a New Standard of Reliability

1.0 Introduction

In the world of enterprise IT, few things are as critical as server reliability. The slightest amount of down time can mean millions of dollars in lost production and revenue. Memory plays a particularly critical role in server reliability because all data, regardless of its source or destination, moves through memory. If the memory doesn't function properly, data corruption is possible, resulting in server downtime.

As the world's largest independent memory manufacturer, Kingston Technology is keenly aware of the stringent requirements for memory used in today's servers. Even though Kingston® is well-known for producing high-quality products, Kingston engineers are always searching for ways to improve the design, manufacturing and testing to yield higher levels of reliability.

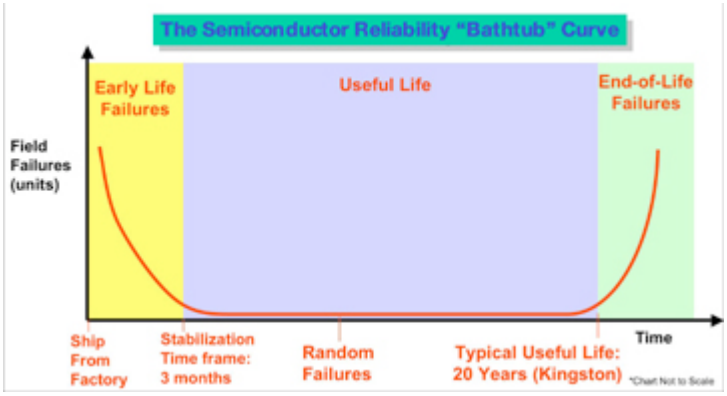
For the last two years, Kingston engineers have been exploring ways to reduce the most common cause of server memory failure, Early Life Failure (ELF). By far the most common cause of failure of memory modules and other electronic components, ELF occurs within the first three months of normal use. Once the memory modules are beyond the ELF period, failures are extremely rare. The engineers have developed a burn-in/testing process that simulates the ELF period, thereby screening out potential ELF failures.

This technical brief provides a detailed explanation of the burn-in/testing process.

2.0 Memory Chip Reliability

Memory chips, as well as all semiconductor devices, follow a particular reliability/failure pattern that is known as the Bathtub Curve (see below).

The Bathtub Curve shows that a memory module that is destined to fail almost always fails during the first three months of operation. Once beyond the ELF period, module failures are extremely rare.



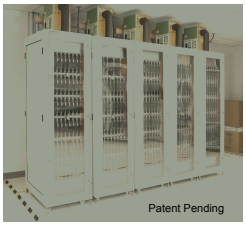
The vertical axis represents field failures of semiconductors, including memory chips. Moving up the left axis, the number of failures is higher.

Time is represented on the horizontal axis, beginning with the factory shipment and continuing through three distinct time periods:

- Early Life Failures: Most failures occur during the early usage period. However, as time goes on, the number of failures diminishes quickly. The Early Life Failure period, shown in yellow, is approximately 3 months.
- Useful Life: During this period, failures are extremely rare. The useful life period is shown in blue and is estimated to be 20+ years.
- End-of-Life Failures: Eventually, semiconductor products wear out and fail. The End-of-Life period is shown in green.

3.0 Kingston KT2400 Burn-In Testers

To solve the Early Life Failure problem, Kingston's engineers designed a proprietary, patent-pending testing platform, the KT2400. KT2400 testers simulate the ELF period with high temperature, high voltage, and pattern testing to screen out potentially defective server memory modules.



Each KT2400 tester can test up to 500 server memory modules simultaneously. Each unit uses specially designed testing platforms called Advanced Pattern Testing Controllers. Server memory modules are tested for 24 hours at 100° Celsius (212° Fahrenheit), at high voltage, and all cells of every DRAM chip are continuously exercised; this high level of stress testing has the effect of aging the modules by at least three months.

4.0 Results of Kingston's 100-Percent Dynamic Burn-in Testing

In March 2004, Kingston began a six-month trial in which 100 percent of its server memory was tested in the KT2400. Results were closely monitored to measure the change in failures. In September 2004, after all the test data was compiled and analyzed, results showed that failures were reduced by 90 percent. These results exceeded expectations and represent a significant improvement for a product line that was already at the top of its class.

The significant reduction in potential memory failures clearly benefits the IT manager. IT managers constantly search for products that reduce the potential for system downtime. Since memory plays such a critical role in server reliability, Kingston's server burn-in process represents a significant leap towards achieving the ultimate in system reliability: zero downtime.

If you have any comments or questions about this technical brief, please email us at webmaster@kingston.com.